Table of Commonly Used Print Features

If switch 5 is DOWN (HP mode):

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
PRINT PITCHES			
Normal (default) (12 cpi, 80 cpl)	ESC & k 0 S	27, 38, 107, 48, 83	1B, 26, 6B, 30, 53
Expanded (6 cpi, 40 cpl)	ESC & k 1 S	27, 38, 107, 49, 83	1B, 26, 6B, 31, 53
Compressed (21.3 cpi, 142 cpl)	ESC & k 2 S	27, 38, 107, 50, 83	1B, 26, 6B, 32, 53
Expanded-Compressed (10.7 cpi, 71 cpl)	ESC & k 3 S	27, 38, 107, 51, 83	1B, 26, 6B, 33, 53
BOLD MODE			
Bold mode on	CTLN	14	0E
Bold mode off (default)	CTLO	15	0F
UNDERLINE			
Underline on	ESC & d D	27, 38, 100, 68	1B, 26, 64, 44
Underline off (default)	ESC & d @	27, 38, 100, 64	1B, 26, 64, 40

If switch 5 is UP (Alternate mode):

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
PRINT PITCHES			
Expanded on	CTLN	14	0E
Expanded off (default)	CTLT	20	14
Compressed on	CTLO	15	0F
Compressed off (default)	CTLR	18	12
Expanded-compressed on	CTLN CTLO	14, 15	0E, 0F
Expanded-compressed off (default)	CTLT CTLR	20, 18	14, 12
BOLD MODE			
Bold mode on	ESC E	27, 69	1B, 45
Bold mode off (default)	ESC F	27, 70	1B, 46
UNDERLINE			
Underline on	ESC - 1	27, 45, 49	1B, 2D, 31
Underline off (default)	ESC - 0	27, 45, 48	1B, 2D, 30

NOTE

When reading this manual, be very careful to not confuse O (uppercase oh) with 0 (zero) or *l* (lowercase ell) with 1 (one).

02225-90012

Printed in Singapore CP/04/84

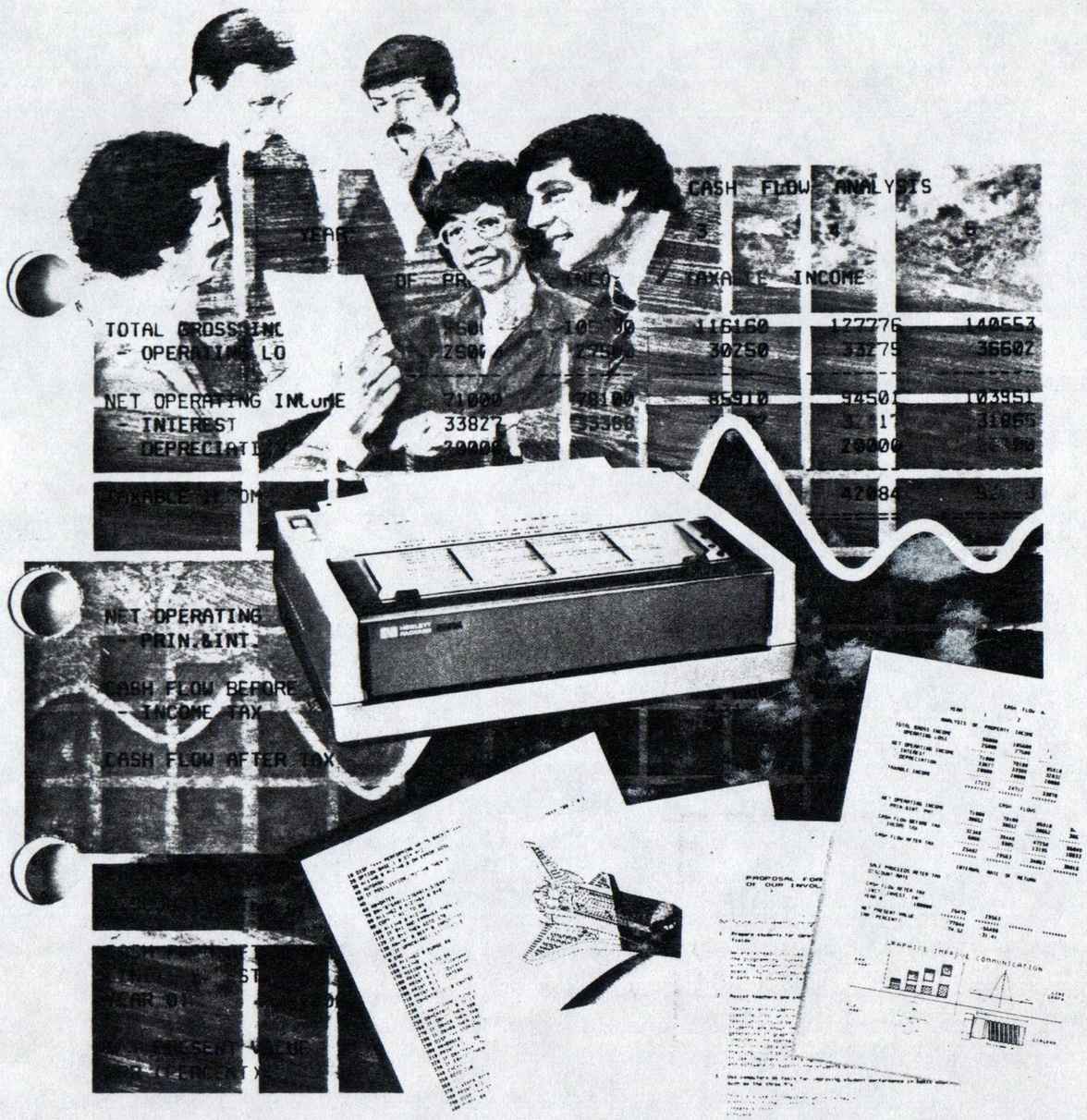
HEWLETT PACKARD

HP 2225C

ThinkJet

The Personal Printer from Hewlett-Packard

REFERENCE MANUAL



HP 2225C
ThinkJet

The Personal Printer from Hewlett-Packard

Reference Manual

April 1984

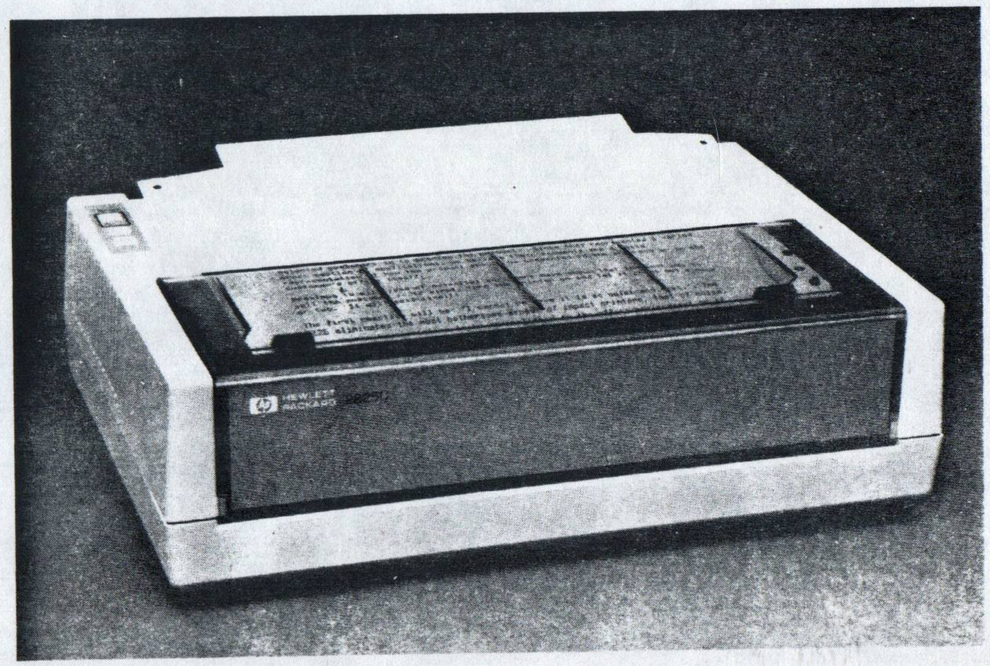
02225-90012

Printed in Singapore

Table of Contents

General Information

Congratulations on your purchase of the Hewlett-Packard 2225C ThinkJet Printer. Your printer is designed to give you years of trouble-free operation. Its small footprint uses little precious desk space. However, do not let its size fool you. It is fast (150 characters per second), intelligent, and offers a wide variety of easy-to-use print features.



HP 2225C ThinkJet Printer

The versatility and convenience of your printer are enhanced by the quietness of its ink jet printing. The ink jet print head cartridge contains sufficient ink to print approximately 500 pages. The cartridge is completely disposable and easy to replace. In addition, the HP 2225C printer uses a standard parallel printer interface to communicate with many different computers.

To set up your printer you will need a printer cable. You should have obtained a printer cable with either your computer or your parallel printer interface card. If you do not have one, contact your Hewlett-Packard dealer or an authorized sales representative.

How to Use Your Reference Manual

Chapter 1, "Setting Up Your Printer," provides all of the information you need to begin operating your printer.

Chapters 2 and 3, "Using Print Features" and "More on Print Features," describe how to use the many advanced print features of the HP 2225C printer.

Chapter 4, "Maintenance and Troubleshooting," offers easy-to-use tips on how to keep your printer running smoothly.

The appendices contain reference guides where you can quickly find information about your printer. Also included in the appendices are the list of accessories and information on warranty and service.

Chapter 1

Setting Up Your Printer

Your HP 2225C ThinkJet Printer was carefully inspected before shipment. Verify that each of the items listed below is present.

- an ink jet print head cartridge
- a packet of fanfold paper
- the owner's manual
- a paper separator
- a power cord
- a warranty card

Optional and replacement accessories are listed in Appendix G.

You are now ready to set up your printer with your computer. In doing so, keep in mind the following guidelines:

- Place the printer on a flat, level surface.
- Choose an area that is relatively free of dust and dirt.
- Avoid operating your printer at temperatures above 104°F (40°C) and below 50°F (10°C).

Power for the Printer

Figures 1-1 and 1-2 show the two possible rear panel configurations for the HP 2225C printer.

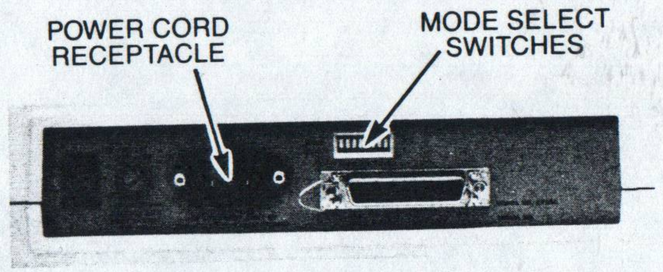


Figure 1-1 United States Rear Panel

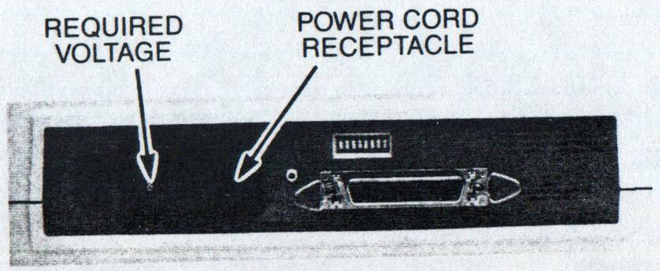


Figure 1-2 International Rear Panel

If the rear panel of your printer looks like Figure 1-1, you must power your printer from a 120 volt AC, 50/60 Hz, outlet. If the rear panel of your printer looks like Figure 1-2, the required line voltage is visible through the small window in the cover of the fuse box. Printers with a rear panel such as Figure 1-2 can be configured to operate from several different line voltages. If you need to change the fuse in your printer or configure it for a different line voltage, refer to the instructions in Appendix E.

WARNING

Your printer may be damaged if you attempt to power it from an incorrect voltage.

To connect the printer to a power outlet, plug one end of the power cord into the receptacle on the rear panel of the printer and plug the other end into an appropriate outlet.

Mode Select Switches

On the rear panel of your printer there are 8 switches which allow you to configure your printer so that it will work with almost any computer system. These switches are numbered from 1 (closest to the power switch) to 8 (farthest from the power switch).

Table 1-1 contains switch settings for several computer systems. If your computer system is not included in the table, or the format of your printouts is incorrect, refer to Appendix A.

Table 1-1
Mode Select Configuration Guide
(8½″ x 11″ paper, English language)

Computer	Switch Settings 1	2	3	4	5	6	7	8
Hewlett-Packard	down	down	down	down	down	down	down	down
IBM PC	down	up	down	down	up	up	down	down
Apple	down	up	down	down	up	up	down	down
Radio Shack	up	down	down	down	up	up	down	down

NOTE

The printer reads the switch settings only when it is first turned on. Therefore if you change any of the switch settings, you must turn the printer off for several seconds and back on before printing.

You cannot damage your printer by setting the switches incorrectly.

The mode select switches can be used to customize your printer for applications such as languages other than English or 12″ paper. See Appendix A for more details.

If switch 5 is up, your printer will work with most software which expects one of the following printers:

- Epson MX-80
- Epson MX-100
- IBM 80 CPS Printer
- IBM Graphics Printer

If switch 5 is down, your printer will work with most software which either does not specify a printer or specifies a Hewlett-Packard printer.

Connecting the Printer Cable

To use your printer with your computer, your computer must be equipped with a parallel printer interface port. You should have obtained a printer cable with either your computer or your parallel printer interface card. If you do not have a printer cable for your computer, contact your Hewlett-Packard dealer or an authorized sales representative.

Insert the end of your printer cable into the connector on the rear panel of your printer and snap the two wire clips of the printer connector onto the end of the cable as shown in Figure 1-3.

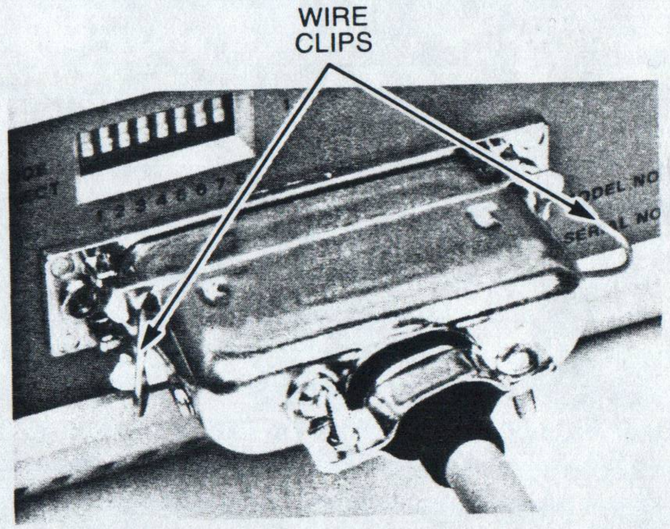


Figure 1-3 Printer Cable Connection

Loading the Print Head Cartridge

Remove the print head cartridge and the absorber from their container, taking care not to touch the face of the print head cartridge.

Open the front cover of the printer and insert the absorber into the holder as shown in Figure 1-4, making sure that the colored side of the absorber faces the back of the printer.

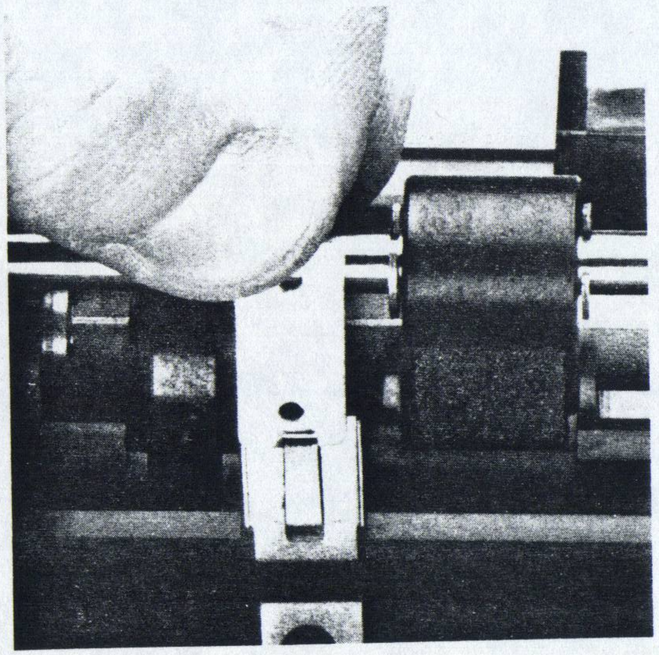


Figure 1-4 Inserting the Absorber

When the printer is turned on, a few drops of ink are sprayed on the absorber to prepare the print head for operation. Absorbers are provided with each print head cartridge and should be replaced each time the cartridge is replaced. To remove a used absorber, insert the tip of a pencil into the hole at the top of the absorber, pull up, and discard.

Never move the carriage while loading the print head cartridge; this may cause damage to your printer.

To load the print head cartridge:

- Open the carriage latch by pushing it down.
- Insert the print head cartridge into the carriage.
- Close the carriage latch by lifting it up. Make sure that the carriage latch is fully closed as shown in Figure 1-5.

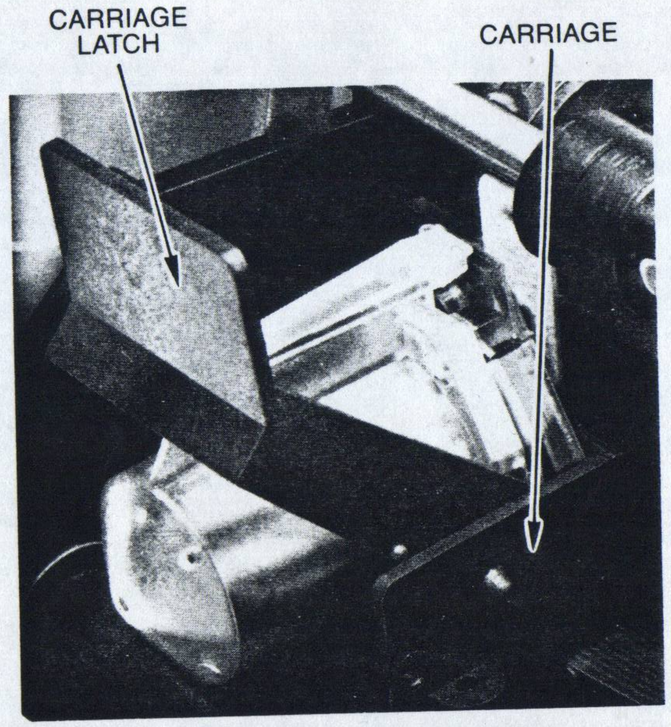


Figure 1-5 Print Head Cartridge Loaded

WARNING

The ink in the print head cartridge contains diethylene glycol which is HARMFUL IF SWALLOWED. Keep new or used cartridges OUT OF REACH OF CHILDREN.

Types of Paper

Your HP 2225C printer is designed to print on standard 8½" x 11" or European size A4, single sheet or fanfold paper. Though your printer will print on any type of paper, best print quality can be assured by using HP-specified ink jet paper. Additional paper stock is available from your dealer or Hewlett-Packard. Refer to Appendix G for more information.

Loading Fanfold Paper

- Open the front cover of the printer.
- Open the bail arm as shown in Figure 1-6.

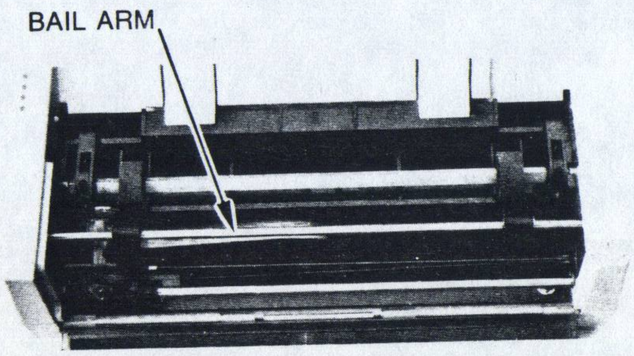


Figure 1-6 Open Bail Arm

- Install the paper separator and raise it as shown in Figure 1-7.

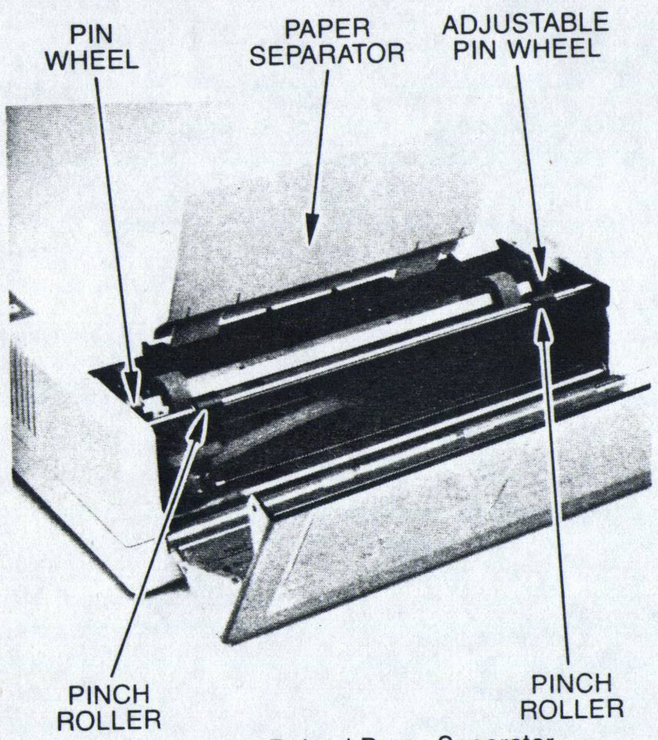


Figure 1-7 Raised Paper Separator

- Slide the paper into the slot under the paper separator and pull the top edge above the bail arm rollers.
- Align the holes in the left side of the paper with the left-side pin wheel.
- Slide the right-side pin wheel to align those pins with the holes in the right side of the paper as shown in Figure 1-8.

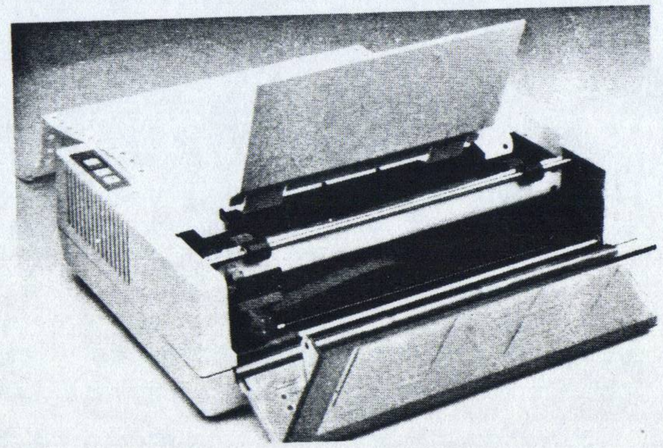


Figure 1-8 Fanfold Paper

- Push the bail arm forward to the closed position.
- Lower the paper separator to the operating position as shown in Figure 1-9.

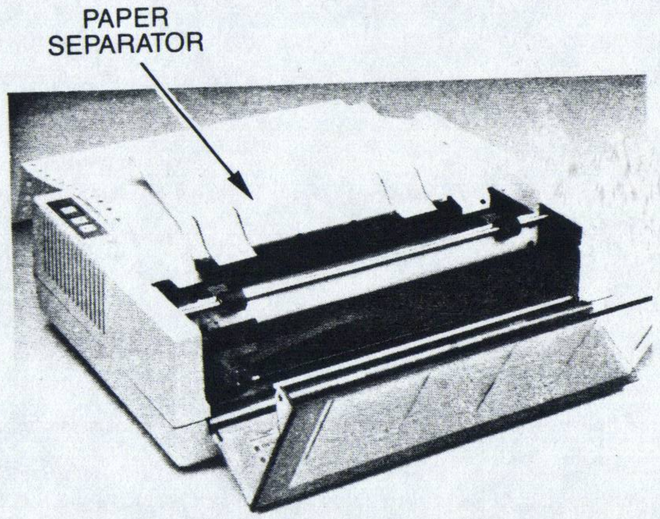


Figure 1-9 Paper Separator Operating Position

- Close the front cover of the printer.

The recommended fanfold paper paths are shown in Figure 1-10.

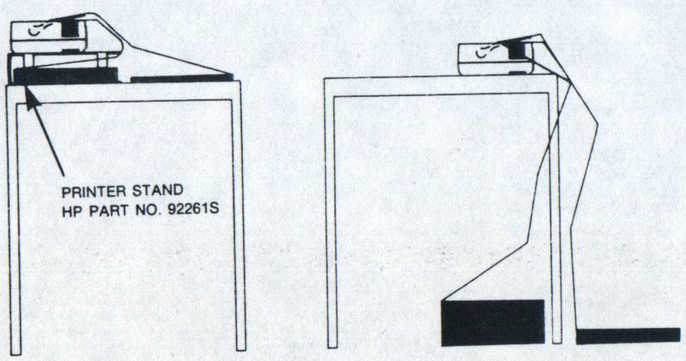


Figure 1-10 Fanfold Paper Paths

Loading Single Sheet Paper

- Open the front cover of the printer.
- Open the bail arm as shown in Figure 1-11.

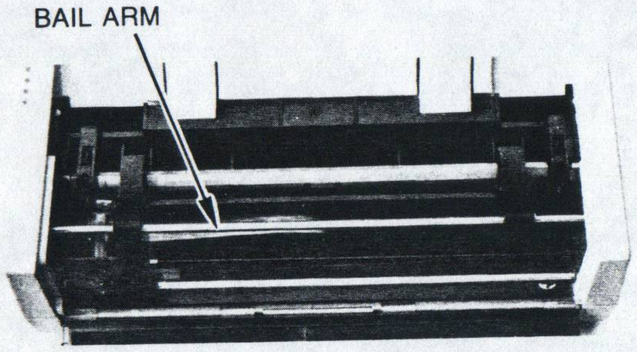


Figure 1-11 Open Bail Arm

- Install the paper separator and raise it as shown in Figure 1-12.

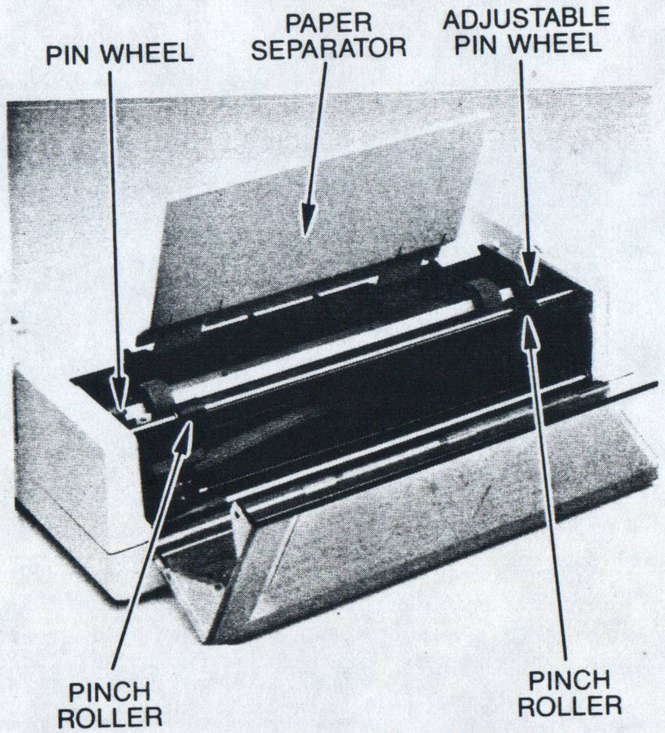


Figure 1-12 Raised Paper Separator

- Slide the paper into the slot under the paper separator. Align the left edge of the paper with the channel on top of the printer case as shown in Figure 1-13.

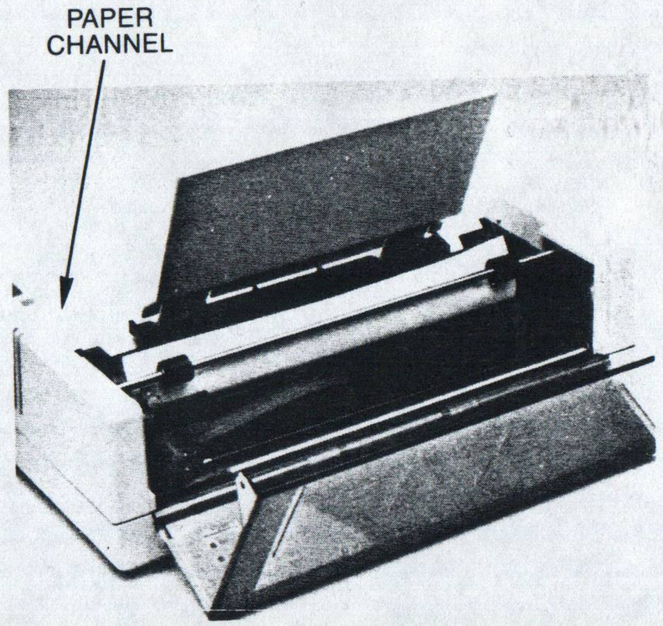


Figure 1-13 Single Sheet Paper

- Pull the top edge of the paper approximately ¼" (6 mm) above the bail arm rollers.
- Push the bail arm forward to the closed position.
- Lower the paper separator to the operating position as shown in Figure 1-14.

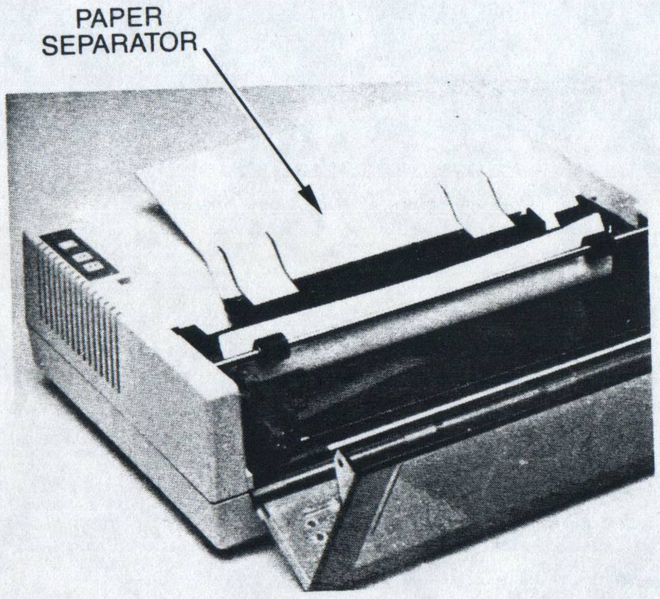


Figure 1-14 Paper Separator Operating Position

- Close the front cover of the printer.

Power Switch

The power switch is located on the rear panel of the printer as shown in Figure 1-15. Turn the printer on by pressing the power switch to position 1.

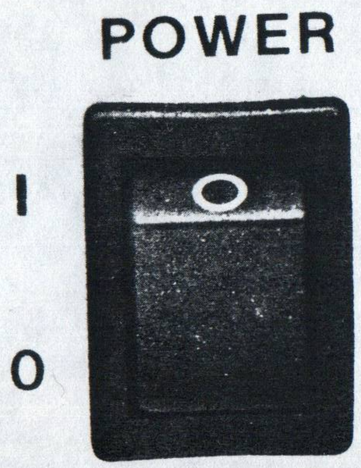


Figure 1-15 Power Switch

NOTE

In some computer systems the printer will not be operational if it is connected to the computer and the computer is turned off. For these systems, you must either disconnect the printer cable or turn the computer on before using the buttons on the printer control panel.

Power (Red) Light

The red power light on the printer's control panel (shown in Figure 1-16) is lit to indicate that the printer is on.

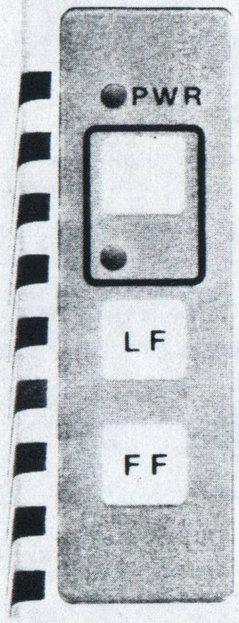


Figure 1-16 Control Panel

Line Feed Button

The line feed button **LF** advances the paper. Tap the line feed button quickly and the paper advances a single dot row. Press the line feed button normally and the paper advances one line. If the line feed button is held down, the paper advances one line, pauses, and then continues rapid line feeds until the button is released.

Form Feed Button

The form feed button FF advances the paper to the next page. The exact position to which the paper advances is called the "top of form."

NOTE

If your printer is not correctly set for the length of paper you are using, the form feed button may not advance the paper the distance you expect. If you need instructions on setting the printer for your length of paper, see pages 2-8 and A-3.

Setting Top of Form

Top of form is set to the current line each time the printer is turned on or the blue button (the top button on the control panel) is pushed.

Normally you should set top of form to the fourth line on the page, which will leave a top margin of ½". To set top of form to the fourth line, use the line feed button to position the paper so that the perforation is just above the pinch rollers, and press the blue button.

Some software packages instruct you to set top of form to the first line of the page. To do this, use the line feed button to position the paper so that the perforation is approximately ¼" (6 mm) below the pinch rollers, and press the blue button.

NOTE

If the printer runs out of paper while printing a document, it will stop automatically. After loading paper and positioning it, press the blue button. This will set top of form and instruct the printer to continue printing the document.

Attention (Yellow) Light

Under normal operating conditions the yellow attention light is off. If the attention light is on, the printer is out of paper. After paper is loaded, the attention light begins flashing. Position the paper using the line feed button and then set top of form with the blue button. The attention light will turn off. The printer is now ready to print.

You should never move the carriage manually or obstruct its movement. If the printer detects that this has happened, it will stop printing. In this event, the print buffer empties, all print features return to their default settings, and the attention light begins flashing. To recover from this error state, remove any obstructions such as crumpled paper from around the carriage and push the blue button.

NOTE

The attention light also blinks if there is paper in the printer and one of the following conditions is present:

- The printer is performing the internal self test immediately after power is turned on.
- A self test error was detected.

Printing Self Test

You can now verify that the printer is operating correctly by using the printing self test. First turn the printer off. Then depress and hold the line feed button while turning the printer on. Release the line feed button to start the self test sequence, which includes a set of printed examples. You can terminate the self test at any time by turning the printer off.

WARNING

The carriage should be against the left side of the printer whenever the printer is off. If the carriage remains in the center of the page for prolonged periods, it is possible for the print head face to come in contact with the paper, causing ink to wick out of the print head cartridge.

If the carriage is not at the left side of the printer, turn the printer on and wait for the carriage to move to the left side of the printer. Then turn the printer off.

Ready to Print

The HP 2225C printer is now prepared for printing. For your convenience, it is designed to print with 1" margins on each side of the page. If you want larger margins, software packages such as word processors should have the capability of increasing them. Other "default" (pre-set) printing specifications are:

- 12 characters/inch
- 80 characters/line
- 6 lines/inch

You should now be able to use your printer with your computer system without reading any more of this manual. However, Chapters 2 and 3 explain how to use other print features such as underlining and bold mode, as well as change the default printing specifications listed above.

Chapter 2

Using Print Features

The previous chapter told you how to set up and begin operating your HP 2225C printer. This chapter will tell you how to use the more commonly selected print modes and form control features: print pitches, bold mode, underlining, line spacing and perforation skip mode. Chapter 3 introduces more advanced print features.

Introduction to Control Codes and Escape Sequences

You may already have software which allows you to use many of the print features of your HP 2225C printer. If, however, you wish to use any of these print features on your own, the following two chapters provide you with examples of each of the print features and the data used to generate those examples.

The print features of your printer are controlled by "control codes" and "escape sequences." Control codes are data that, when sent to your printer, do not cause anything to be printed. They are commands which cause an action. An example of how control codes are written in this manual is CTL N, which is pronounced "control N."

One of the control codes is named "escape," which in this manual is written as ESC. Escape sequences consist of the ESC control code followed by one or more other characters. For example, ESC & k 1 S is an escape sequence which changes the print pitch. None of the characters in an escape sequence is printed; together they form a command which is used to control a feature of your printer, just as a single control code is a command.

NOTE

When reading this manual, be very careful to not confuse O (upper-case oh) with 0 (zero) or *l* (lowercase ell) with 1 (one).

Some features are controlled by both a mode select switch on the rear panel of the printer and an escape sequence. In these cases, the switch sets the default condition of the feature but the escape sequence will override the switch. If the printer is turned off and on, the feature will return to the setting selected by the switch.

To generate printouts using these print features, you will need to become familiar with the method used by your computer or software to send escape sequences and control codes to your printer. Some of the different methods commonly used are:

- Typing escape sequences and control codes directly from the keyboard.

  Many computer keyboards have a key labeled **ESC** and another key labeled **CNTL**, **CTL**, or **CTRL**. When the **ESC** key is pressed, it generates the escape control code. Other control codes are generated by holding down the **CTL** key while pressing a different key, just as holding down the **SHIFT** key while pressing another key generates special puncuation characters and uppercase characters. On some keyboards that do not have an **ESC** key, [ESC] can be generated as [CTL [].

> **NOTE**
>
> If you are entering escape sequences in this manner, do not type any spaces between the characters of the escape sequence. In this manual spaces are sometimes inserted in the escape sequences for readability; they are not actually a part of the escape sequence.

- Specifying each control code, including [ESC], by its ASCII* number.

  Some software packages require that you specify each control code by its ASCII number, usually preceded by a special character such as "\". For example, the escape sequence [ESC] & k 1 S would be specified as \027 & k 1 S. Appendix D contains the ASCII representation of each control code.

- Specifying each character of the escape sequence by its ASCII number.

  Some software packages require that you specify [ESC] and the characters following it by their ASCII numbers. The reference tables in Appendices B and C contain the ASCII representation of each escape sequence.

  As an example, the escape sequence [ESC] & k 1 S is represented in ASCII as 27 38 107 49 83.

*The ASCII (American Standard Code for Information Interchange) character tables in Appendix D assign a number between 0 and 255 to every character or control code recognized by the printer. Computers use these numbers when storing and communicating text material. Unless specifically noted otherwise, the numbers used in this manual are decimal numbers. A few software packages require you to enter ASCII numbers in "hexadecimal." The reference tables in Appendices B and C include the hexadecimal representation of each control code and escape sequence.

If you are using a software package such as a word processor or spreadsheet, refer to your software documentation to learn how to represent control codes and escape sequences.

If you are writing BASIC programs, you can generate control codes with the CHR$( ) function. For more information on the CHR$( ) function, refer to a BASIC programming manual.

In this manual, CHR$( ) is used to specify numbers which are ASCII numbers, not characters. For example, 83 and CHR$(83) are two different things. The first, 83, is a string of two characters: 8 and 3. CHR$(83) is a single character, uppercase "S".

Control Sequence Modes

The HP 2225C printer has two different control sequence modes: HP Control Sequence Mode (HP mode) and Alternate Control Sequence Mode (Alternate mode). The escape sequences and control codes which control the print features are different for the two modes. If the printer receives an escape sequence or control code which is invalid for the current mode, it will either ignore the command or produce unexpected results. However, do not be afraid of making mistakes. You cannot damage your printer with an invalid escape sequence.

Switch 5 on the rear panel of the printer determines which mode is currently being used. If switch 5 is down, the printer is in HP Control Sequence Mode; if switch 5 is up, the printer is in Alternate Control Sequence Mode. Page A-3 discusses choosing the appropriate control sequence mode for your computer system.

The following sections discuss both control sequence modes for each print feature. For reference purposes, Appendix B lists all of the HP mode control sequences; the control sequences for Alternate mode are listed in Appendix C.

Print Pitches

Your HP 2225C printer offers four print pitches: normal, expanded, compressed, and expanded-compressed.

```
This is compressed print.
This is normal print.
This is expanded-compressed print.
This is expanded print.
```

If switch 5 is DOWN (HP mode):

Table 2-1 provides the specific escape sequence for each print pitch.

Table 2-1
Print Pitches (HP Mode)

Print Pitch	Characters/Inch	Characters/Line	Escape Sequence
Compressed	21.3	142	ESC & k 2 S
Normal	12.0	80	ESC & k 0 S
Expanded-Compressed	10.7	71	ESC & k 3 S
Expanded	6.0	40	ESC & k 1 S

If more characters per line are sent than is allowed by the selected print pitch, the additional characters are normally ignored. To print those additional characters, you may use the wrap-around mode described in Chapter 3.

The data used to generate the preceding example is:

```
ESC &k2SThis is compressed print.
ESC &k0SThis is normal print.
ESC &k3SThis is expanded-compressed print.
ESC &k1SThis is expanded print.
```

If switch 5 is UP (Alternate mode):

Table 2-2 specifies the control codes which turn on or off each of the print pitches.

Table 2-2
Print Pitches (Alternate Mode)

Print Pitch	Chars/Inch	Chars/Line	Turn On	Turn Off
Compressed	21.3	142	CTLO	CTLR
Normal	12.0	80	default	
Expanded-Compressed	10.7	71	CTLN CTLO	CTLT CTLR
Expanded	6.0	40	CTLN	CTLT

The data used to generate the preceding example is:

```
CTLO This is compressed print.CTLR
This is normal print.
CTLN CTLO This is expanded-compressed print.CTLT CTLR
CTLN This is expanded print.CTLT
```

Bold Print

The HP 2225C printer can print characters either normal or "bold" (darker).

```
Bold mode can highlight single words.
Entire lines can also be highlighted.
```

If switch 5 is DOWN (HP mode):

The bold print mode is enabled by CTLN. The printer will then print darker characters until bold mode is disabled with CTLO.

The data used to generate the preceding example is:

```
Bold mode can CTLNhighlightCTLO single words.
CTLNEntire lines can also be highlighted.CTLO
```

If switch 5 is UP (Alternate mode):

The bold print mode is enabled by ESC E. The printer will then print darker characters until bold mode is disabled with ESC F.

The data used to generate the preceding example is:

```
Bold mode can ESCEhighlightESCF single words.
ESCEEntire lines can also be highlighted.ESCF
```

Underlining

Your HP 2225C printer can underline text as shown in the following example.

```
Underlining can be used for a single word.
Entire lines can be underlined.
```

If switch 5 is DOWN (HP mode):

Underline mode is enabled by [ESC] & d D. The printer will then underline all characters until underline is disabled by [ESC] & d @.

The data used to generate the preceding example is:

```
Underlining can be used for a [ESC]&dDsingle[ESC]&d@ word.
[ESC]&dDEntire lines can be underlined.[ESC]&d@
```

If switch 5 is UP (Alternate mode):

Underline mode is enabled by [ESC] -1. The printer will then underline all characters until underline is disabled by [ESC] -0.

The data used to generate the preceding example is:

```
Underlining can be used for a [ESC]-1single[ESC]-0 word.
[ESC]-1Entire lines can be underlined.[ESC]-0
```

Mixing Modes

The HP 2225C printer is capable of mixing any combination of print modes. For example, it can print in expanded and underlined mode. The printer does not limit the number of mode changes allowed in a single line.

```
Print modes can be mixed on a line.
```

If switch 5 is DOWN (HP mode):

The data used to generate the preceding example is:

```
Print modes can be mixed on a [ESC]&k1S[ESC]&dDline[ESC]&d@ [ESC]&k0S.
```

If switch 5 is UP (Alternate mode):

The data used to generate the preceding example is:

```
Print modes can be mixed on a [CTLN][ESC]-1line[ESC]-0[CTLT].
```


Perforation Skip

The HP 2225C printer is capable of automatically leaving top and bottom margins on every page. This is called "perforation skip mode" because, when printing, the printer does not print on the perforations, it skips over them.

The printer does not sense the perforations in the paper; you must tell it where to put the margins by setting top of form as described on page 1-12. When you set top of form, you specify the position of the first line of print: the line immediately following the top margin. The default "perforation skip length" (combined length of the top and bottom margins) is 6 lines. If top of form is set to the fourth line of the page, the printer will leave a margin of three lines at the top and bottom of each page.

Figure 2-1 shows top of form set correctly for equal top and bottom margins.

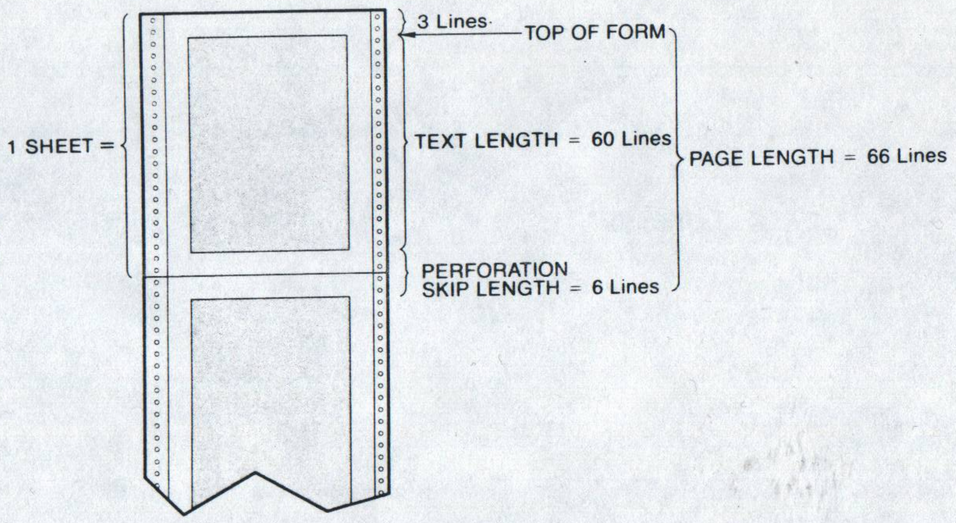


Figure 2-1 Top and Bottom Margins

Switch 3 on the rear panel of the printer determines whether perforation skip mode defaults on or off. If switch 3 is down, perforation skip mode defaults off; if switch 3 is up, perforation skip mode defaults on.

If switch 5 is DOWN (HP mode):

The escape sequence ESC & *l* 1 L turns perforation skip mode on, ESC & *l* 0 L turns it off. These escape sequences override switch 3.

The perforation skip length is not specified directly. If you wish to use a value other than the default, you must specify a new "text length," which is the number of lines to be printed on each page. The perforation skip length is the total length of each page minus the text length.

The escape sequence to set the text length is ESC & *l* # F, where # is the text length specified in number of lines. For example, the escape sequence ESC & *l* 54 F sets the text length to 54 lines. If the printer is set for a page length of 66 lines (11 inch paper, 6 lines per inch), the perforation skip length is 66 minus 54: 12 lines. To get equal top and bottom margins of 6 lines, top of form must be set to the seventh line of the page.

Text length cannot be less than one line nor greater than the page length. The escape sequence ESC & *l* 0 F will set the text length back to the default, which is 1 inch less than the page length.

If switch 5 is UP (Alternate mode):

The escape sequence ESC N CHR$(#) sets the perforation skip length to # lines and turns perforation skip mode on. The number used to set the perforation skip length is the ASCII number associated with the character following "N." For example, ESC N 1 does not set perforation skip length to 1 line, the ASCII number for the character "1" is 48 (see Appendix D), so perforation skip length is set to 48 lines. To set the perforation skip length to 10 lines, look in Table D-1 of Appendix D and find that 10 is equivalent to CTL J. Then use the escape sequence ESC N CTL J.

The escape sequence ESC O turns perforation skip mode off.

These escape sequences override switch 3.

Page Length

The HP 2225C printer allows you to change the page length. The current value of page length determines how far the printer advances the paper when the form feed button is pressed or the printer receives a form feed control code. The printer also uses the value of page length, when perforation skip mode is on, to determine where to place the top and bottom margins.

Switch 4 on the rear panel of the printer selects the default page length. If switch 4 is down, page length defaults to 11 inches (279.4 mm), which is 66 lines at 6 lines per inch. If switch 4 is up, page length defaults to 12 inches (304.8 mm), which is 72 lines at 6 lines per inch.

If switch 5 is DOWN (HP mode):

The escape sequence ESC & *l* # P sets the page length to # lines. For example, ESC & *l* 50 P sets the page length to 50 lines. This escape sequence overrides switch 4.

Page length can be set to any number of lines from 1 to 255. The escape sequence ESC & *l* 0 P will reset the page length to the default.

The page length escape sequence automatically sets the text length to 1 inch (6 lines at 6 lines per inch) less than the new page length.

If switch 5 is UP (Alternate mode):

The escape sequence ESC C CHR$(#) sets the page length to # lines. The number used to specify the page length is the ASCII number associated with the character following "C." For example, ESC C 1 does not set page length to 1 line. The ASCII number associated with the character "1" is 48, so page length is set to 48 lines. To set page length to 70 lines, look up 70 in Table D-1 of Appendix D and find that 70 is equivalent to the character "F". Then use the escape sequence ESC C F.

The escape sequence ESC C CHR$(0) CHR$(#) sets the page length to # inches. The number used to specify the page length is the ASCII number associated with #.

These escape sequences also turn perforation skip mode off.

Line Spacing

The HP 2225C printer offers different line spacings as shown in the following example.

```
This group of lines is printed at a
line spacing of 8 lines per inch.  Notice that
they are close together.

These three lines are printed at
the default line spacing of
6 lines per inch.
```

If switch 5 is DOWN (HP mode):

To print at 8 lines per inch, send the escape sequence [ESC] &*l*8 D. To return to 6 lines per inch, use [ESC] &*l*6 D.

If line spacing is changed, page length and text length measured in inches remain the same. For example, if line spacing is 6 lines per inch and page length is 66 lines (11 inches), changing line spacing to 8 lines per inch will also change page length to 88 lines (11 inches).

The data used to generate the preceding example is:

```
[ESC] &l8DThis group of lines is printed at a
line spacing of 8 lines per inch. Notice that
they are close together.[ESC] &l6D

These three lines are printed at
the default line spacing of
6 lines per inch.
```

If switch 5 is UP (Alternate Mode):

To print at 8 lines per inch, send the escape sequence [ESC] 0. To return to 6 lines per inch, use [ESC] 2. To set line spacing to 7 dot rows (96/7 lines per inch), use [ESC] 1. [ESC] A CHR$(#) sets line spacing to # dot rows. The number used to set the line spacing is the ASCII number associated with the character following "A." For example, [ESC] A [CTLT] sets the line spacing to 20 dot rows because the ASCII value of [CTLT] is 20.

The data used to generate the preceding example is:

```
[ESC] 0This group of lines is printed at a
line spacing of 8 lines per inch. Notice that
they are close together.[ESC] 2

These three lines are printed at
the default line spacing of
6 lines per inch.
```


Chapter 3

More on Print Features

In the previous chapter we discussed the frequently used print features. In this chapter we will discuss some advanced print features.

Positioning the Print on the Page

Some of the control codes and escape sequences change the position at which the next character received will be printed. This position is called the "current active position." Each time the printer receives a printing character, the current active postion is moved one character to the right. The following control codes separate lines of print, cause the printer to overstrike characters, or cause the printer to advance the paper.

Unless specifically noted otherwise, these control codes and escape sequences are identical in HP mode (switch 5 down) or Alternate mode (switch 5 up).

- Carriage Return ([CTLM]): Moves the current active position to the first character position on the current line. Normally you do not need to send carriage returns explicitly; your computer system will send them automatically.

  Either switch 1 on the rear panel of the printer or the Automatic Line Termination escape sequence discussed on page 3-9 can cause the printer to perform a line feed in addition to each carriage return.

- Back Space ([CTLH]): Moves the current active position one character to the left. If the current active position is already the leftmost character position, no action is taken.

- Line Feed ([CTLJ]): Advances the paper one line. Normally you do not need to send line feeds explicitly; your computer system will send them automatically.

  Either switch 2 on the rear panel of the printer or the Automatic Line Termination escape sequence discussed on page 3-9 can cause the printer to perform a carriage return in addition to each line feed.

- Half Line Feed ([ESC] =): Advances the paper half the distance of the current line spacing.

  This escape sequence is only valid if switch 5 is down (HP mode). If switch 5 is up (Alternate mode) you must change the line spacing and then send a line feed control code.

Half line feed is useful for printing subscripts and superscripts.

H_2O

$a^3=b^2+c$

The data used to generate the preceding example is:

```
H 0[ESC]=[CTLM] 2
  3  2[ESC]=[CTLM]a =b +c
```

- Form Feed ([CTLL]): Advances the paper to the top of the next form.

NOTE

The printer cannot sense the actual position of the paper. For form feed to advance the paper to the next perforation, top of form must be set correctly as described on page 1-12.

Overstrike

There are two methods of overstriking text:

- Sending two lines of text separated only by a carriage return. This causes the printer to print the second line over the first line.

  This method will work only if carriage return does not perform a line feed (see Carriage Return on page 3-1). If carriage return does perform a line feed, you must use the back space method for overstriking.

- Using back space. Each time the printer receives a back space control code, it moves the current active position one character position to the left before printing the next character. Therefore, if two characters are sent to the printer separated only by a back space, the second character is printed over the first.

Graphics

Many computer systems allow you to draw graphs or pictures on your computer display using the computer's capabilities and a graphics software package. The computer then handles the details of copying the graphics data to the printer. You may, however, be interested in writing your own graphics software program. The following information provides the details of the HP 2225C graphics capabilities.

The HP 2225C printer is capable of printing in two modes: text mode and graphics mode. In text mode, the printer interprets each data byte it receives from the computer as an ASCII character. It then looks that character up in its internal character table and prints the dot pattern which it finds. In graphics mode, however, the data received from the computer directly specifies the dot pattern which is to be printed.

The HP 2225C uses a form of graphics called "dot-image" graphics. In this system, the paper can be thought of as consisting of a grid of dot positions. Graphics data specifies which of the dot positions should be printed and which should be left blank.

NOTE

Some computers automatically add control codes, such as carriage returns and line feeds, or blanks to the data being sent to the printer. These characters are necessary when printing text. In graphics mode, however, they may be interpreted as graphics data and give unexpected results. Before writing programs which generate graphics, you should consult the manual for your computer to determine how to prevent your computer from sending this extra data to the printer.

If switch 5 is DOWN (HP mode):

Graphics Density

The HP 2225C is capable of printing graphics in two different dot densities. The default dot density is 96 dots/inch in both the horizontal and vertical directions; the print region is 640 dots wide. The higher dot density is 192 dots/inch in the horizontal direction and 96 dots/inch in the vertical direction; the print region is 1280 dots wide. The escape sequence used to select high density graphics is [ESC] *r 1280 S. To return to the default graphics density use [ESC] *r 640 S. Once the graphics resolution is specified, it stays in effect until it is explicitly changed or the printer is reset.

Raster Dot Row

Graphics data is sent to the printer one byte (8 bits) at a time. Each bit specifies one dot position. If a bit is zero, the corresponding dot position is left blank. If a bit is one, a dot is printed at the corresponding position. In HP mode, graphics data bytes are sent to the printer in groups, where each group contains the graphics data for one "raster" (horizontal) dot row. The first (most significant) bit of a graphics data byte specifies the leftmost dot; the last (least significant) bit specifies the rightmost dot.

The escape sequence to transfer the data for one dot row is ESC * b # W. The value field, #, specifies the number of graphics data bytes which follow the escape sequence. For example, if the printer receives ESC * b 20 W, it interprets the next 20 bytes of data as specifying 160 dots (20 x 8 bits) of the current dot row. If less data is sent for a dot row than will fit in the print region, the rightmost dots of the row are left blank. If more data is sent than will fit in the print region, the extra data is ignored.

Paper advance occurs automatically between graphics dot rows; it is not necessary to send any paper advance control codes.

Beginning and Ending Graphics Mode

If the printer has a partial line of text data in its buffer and it receives the raster dot row escape sequence, it terminates the line of text with a carriage return (but no line feed), prints it, and then accepts the graphics data. This may cause the graphics data to be printed over the text data.

To avoid printing graphics over text, send the escape sequence ESC * r A before sending any graphics data. This escape sequence causes any partial lines of text to be terminated with a carriage return and line feed. If there is no text in the buffer, this escape sequence has no effect.

When the printer receives graphics data, it places that data in its buffer. Normally the graphics data is not actually printed until the buffer contains 12 dot rows of default-density graphics or 6 dot rows of high-density graphics. To make sure all of the dot rows are printed and not still stored in the printer's buffer, send the escape sequence ESC * r B after sending all of the graphics data.

Sample Graphics Program

The following is an example of a simple HP BASIC program which prints graphics.

Enter	Description
10 PRINT CHR$(27)&"*r640S";	Select default graphics density
20 PRINT CHR$(27)&"*rA";	Begin raster graphics
30 FOR I=1 TO 55	55 dot rows will be printed
40 PRINT CHR$(27)&"*b5W";	Initiate a dot row of length 5 bytes
50 FOR J=1 TO 5	5 bytes = 40 dots
60 PRINT CHR$(136);	Send 1 byte of graphics data
70 NEXT J	136 decimal = 10001000 binary
80 NEXT I	
90 PRINT CHR$(27)&"*rB"	Terminate raster graphics

Printer output:

You may need to modify this program to make it run correctly on your computer. To produce the preceding graphics example using Microsoft BASIC, Version A2.00, use the following program:

Enter	Description
10 OPEN "LPT1:" AS #1	Prevent the computer from
20 WIDTH #1,255	sending CR, LF
	Select default graphics density
30 PRINT #1, CHR$(27)+"*r640S";	Begin raster graphics
40 PRINT #1, CHR$(27)+"*rA";	55 dot rows will be printed
50 FOR I=1 TO 55	Initiate a dot row of length 5 bytes
60 PRINT #1, CHR$(27)+"*b5W";	5 bytes = 40 dots
70 FOR J=1 TO 5	Send 1 byte of graphics data
80 PRINT #1, CHR$(136);	136 decimal = 10001000 binary
90 NEXT J	
100 NEXT I	
110 PRINT #1, CHR$(27)+"*rB"	Terminate raster graphics

If switch 5 is UP (Alternate mode):

In Alternate mode, each byte of graphics data specifies an 8-dot high column. The first (most significant) bit specifies the top dot of the column; the last (least significant) bit specifies the bottom dot of the column. If a bit is zero, the corresponding dot position is left blank. If a bit is one, a dot is printed at the corresponding position.

You can specify the horizontal distance between adjacent columns as either 1/96 inch or 1/192 inch. The escape sequence ESC K #1 #2 selects default-density graphics (1/96 inch between columns), ESC L #1 #2 selects high-density graphics (1/192 inch between columns).

The 2-byte value field (#1 and #2) specifies the number of following bytes which are to be interpreted as graphics data. #1 and #2 are not interpreted as ASCII characters; they form a 16 bit binary number where #2 is the most significant byte and #1 is the least significant byte. For example, ESC K CHR$(128) CHR$(1) specifies that the next 384 bytes (128 + (256 * 1) = 384) of data are graphics dot columns which are to be printed 1/96 of an inch apart.

Before sending any graphics data, line spacing should be set to 8 dot rows by the ESC A CHR$(8) escape sequence. After sending all of the graphics columns across one row, you must send a carriage return and line feed to the printer to cause it to advance the paper and return to the left margin.

Some computer systems do not have the capability of controlling the most significant bit of data bytes sent to the printer. If your computer system always clears this bit, you can still print graphics by setting line spacing to 7 dot rows (by either ESC 1 or ESC A CHR$(7)) before sending graphics data.

Selecting Unidirectional or Bidirectional Printing

The HP 2225C printer normally prints text bidirectionally. You can get slightly better alignment between lines of print by setting the printer to print unidirectionally (left to right only).

If switch 5 is DOWN (HP mode):

The escape sequence ESC & k 0 W will force unidirectional printing. To return to bidirectional text printing, use ESC & k 1 W.

This escape sequence does not affect graphics printing; the printer always prints graphics unidirectionally.

If switch 5 is UP (Alternate mode):

The escape sequence ESC U 1 will force unidirectional printing. To return to bidirectional text printing, use ESC U 0.

This escape sequence does not affect graphics printing; the printer always prints graphics unidirectionally.

End of Line Wrap-Around

If the printer is in wrap-around mode, the first character received which exceeds the line length of the printer forces a new line of print to be started. This causes long lines to be broken and printed as several lines. If the printer is not in wrap-around mode, characters which exceed the line length of the current print pitch are not printed.

If switch 5 is DOWN (HP mode):

The default is wrap-around mode disabled. The escape sequence ESC & s 0 C enables wrap-around mode, ESC & s 1 C disables wrap-around mode.

If switch 5 is UP (Alternate mode):

The printer is always in wrap-around mode; you cannot disable it.

Linking Escape Sequences

If switch 5 is DOWN (HP mode):

You can link several escape sequences into one escape sequence string. For example, you can enable perforation skip mode and set line spacing to 8 lines per inch by entering either ESC & *l* 8 D and ESC & *l* 1 L or ESC & *l* 8 d 1 L.

The two rules to follow when linking escape sequences are:

- The first two characters after ESC must be the same. In the example above these are & and *l*. ESC and the first two characters following it are used only once in a string of linked escape sequences.
- The final character of the internal escape sequences becomes lower case. In the example above, D becomes d.

If switch 5 is UP (Alternate mode):

It is not possible to link escape sequences; each one must be sent exactly as it is specified in this manual.

Display Functions Mode

Control codes and escape sequences are not normally printed; they are either recognized as commands and cause some action or they are ignored.

The display functions mode allows you to print control codes and escape sequences without executing them. This is useful if you are trying to determine exactly what control codes and escape sequences are being sent to your printer. The symbol which is printed for each control code can be found in Table D-1 of Appendix D.

```
In Display Funtions mode, control codes
are printed not executed.
&k
+In &Display Funtions mode&l, control codes&k
+are printed &l&dDnot&l&d@ executed.&k
+&l&Z
```

If switch 5 is DOWN (HP mode):

Display functions mode is enabled by [ESC] Y and disabled by [ESC] Z.

When in display functions mode, the only control codes or escape sequences executed are:

- Carriage Return, which is printed and then executed as a carriage return and line feed.
- [ESC] Z, which is printed and then executed.

The data used to generate the preceding example is:

```
In [CTLN]Display Functions mode[CTLO], control codes
are printed, [ESC]&dDnot[ESC]&d@, executed.
[ESC]Y
In [CTLN]Display Functions mode[CTLO], control codes
are printed, [ESC]&dDnot[ESC]&d@, executed.
[ESC]Z
```

If switch 5 is UP (Alternate mode):

There is no display functions mode; escape sequences and control codes are always executed.

Self Test

If switch 5 is DOWN (HP mode):

Your HP 2225C printer can perform a self test to ensure that it is operating properly. The escape sequence [ESC] z causes it to perform a test of the electronics and then print one page of characters.

In addition, page 1-13 explains how to perform a power-up self test.

If switch 5 is UP (Alternate mode):

There is no escape sequence to cause a self test. The power-up self test described on page 1-13 must be used.

Resets

The simplest way to return your printer to its default printing specifications is to turn the printer off for several seconds, then on. This causes the printer to read the mode select switches, reset all features to their default values, and set top of form to the current line.

If switch 5 is DOWN (HP mode):

The escape sequence [ESC] E causes the printer to print whatever data is in the print buffer, reset all features to their default values, and, if the paper is not at the top of form, execute a form feed.

This escape sequence does not cause the mode select switches to be read. The printer will use the value it read when it was turned on.

If switch 5 is UP (Alternate mode):

The escape sequence [ESC] @ causes the printer to reset all features to their default values.

This escape sequence does not cause the mode select switches to be read. The printer will use the value it read when it was turned on.

Automatic Line Termination

Most computers terminate each line with a carriage return and a line feed. However, there are computers which terminate with either a carriage return or a line feed, but not both. In order for your printer to operate normally with these systems, you need to change the definition of the carriage return and line feed control codes. This can be done with either switches 1 and 2 on the rear panel of your printer (see Appendix A) or with the escape sequences of Table 3-1.

If switch 5 is DOWN (HP mode):

Table 3-1
Automatic Line Termination Escape Sequences

Character* received by printer	Character(s) executed by printer	Escape Sequence
CR LF FF	CR LF FF	ESC & k 0 G
CR LF FF	CR, LF LF FF	ESC & k 1 G
CR LF FF	CR CR, LF CR, FF	ESC & k 2 G
CR LF FF	CR, LF CR, LF CR, FF	ESC & k 3 G

*Note: CR = Carriage Return
LF = Line Feed
FF = Form Feed

These escape sequences override switches 1 and 2.

If switch 5 is UP (Alternate mode):

There are no escape sequences to change the definition of carriage return, line feed, or form feed control codes. You must use switches 1 and 2 to specify their definition.

Chapter 4

Maintenance and Troubleshooting

Your HP 2225C printer is designed for durability. The printer can operate in a wide range of environmental conditions with very little maintenance. This chapter provides a few basic instructions on care and some simple troubleshooting instructions for printer malfunctions.

Environmental Conditions

Your printer should be maintained and operated under the following environmental conditions:

- Operate only at temperatures from 50°F to 104°F (10°C to 40°C).
- Store only at temperatures from −4°F to 140°F (−20°C to 60°C).
- Operate only in relative humidity from 10% to 90%.

Maintenance of the Print Head Cartridge

The print head cartridge is durable, disposable, and easy to maintain. Observe a few simple rules of care, and your print head cartridge should be trouble-free.

- Avoid touching the face of the print head cartridge with your fingers.
- Periodically check the ink level of the print head cartridge. Hold the cartridge up and view the bladder inside. If the bladder is collapsed, then the ink supply is nearly depleted and the cartridge needs to be replaced.

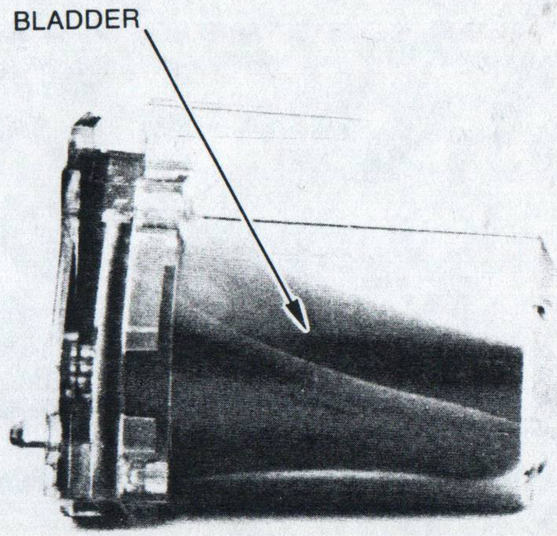


Figure 4-1 Empty Cartridge

- If the printer has not been used for a prolonged period, or if dust has accumulated on the face of the print head cartridge, wipe the face of the cartridge with a tissue to maintain best print quality. If print quality problems remain, see Table 4-1.

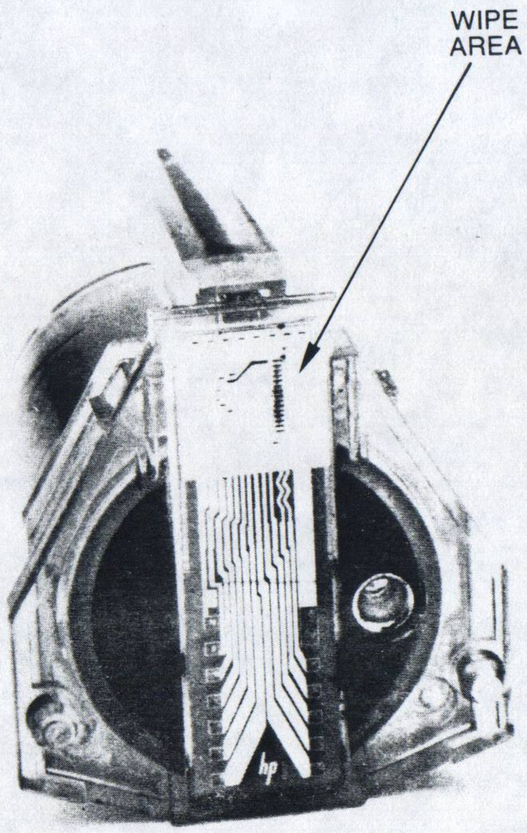


Figure 4-2 Wipe Area

- Avoid allowing the face of the print head cartridge to come into prolonged contact with other materials. This may cause the ink to wick out of the cartridge.
- Use the print head cartridge prior to the month and year of expiration printed on the package.

WARNING

The ink in the print head cartridge contains diethylene glycol which is HARMFUL IF SWALLOWED. Keep new or used cartridges OUT OF REACH OF CHILDREN.

Maintenance of the Printer

Ideally your printer should be stored and operated in a clean, dust-free environment. However, it can endure some rugged use.

To remove dirt and smudges, damp wipe with a mild solution of dishwashing detergent and water. Never use harsh chemicals to clean the printer. Unplug the printer prior to cleaning.

Periodically clean the paper dust out of the printer.

Fuse Replacement

Appendix E contains instructions for replacing the fuse in your printer. A blown fuse may be a sign of a malfunction in your printer. If you experience trouble with blown fuses, do not continue installing new ones; return your unit for repair.

Troubleshooting

Table 4-1 contains some possible error conditions and recommended corrective action. In most instances, performing the corrective action described will eliminate the problem. If the problem persists, however, the printer should be returned for repair.

Table 4-1
Error Conditions

Error Condition	Correction Action
1. Red power light off.	• Ensure that the power cord is plugged into a working outlet and the power switch is on (see pages 1-2 and 1-10). • Ensure that the voltage selector is correctly set (see Appendix E). • Ensure that the fuse is installed correctly and not blown (see Appendix E).
2. Yellow attention light on continuously.	• Load paper into the printer. The attention light will begin flashing (see page 1-12).
3. Yellow attention light flashing.	• Press the blue button. The carriage will move and the attention light will turn off (see page 1-12). • Remove any obstruction from around the carriage and press the blue button again (see page 1-12). • If the attention light continues flashing, the printer should be returned for repair.

4. Printer does not respond to computer.	• Ensure that the power light is on and the attention light is off. If this is not the case, refer to error conditions 1 through 3 above. • Verify that the printer is operational by running the self test (see page 1-13). • Your computer may be sending all data bytes to the printer with the high bit set. If you are using the Roman-8 character set, control codes with the high bit set are not recognized. Try using one of the 7 bit character sets such as US ASCII (see Appendix D).
5. The format of your printouts is incorrect. Lines may start in the wrong place or the top and bottom margins are excessive.	• Your printer is not correctly configured for your computer system. Refer to Table 1-1 of Chapter 1 for switch configurations or work through the instructions in Appendix A for setting the mode select switches of your printer.
6. Paper does not feed properly.	• Remove the paper from the printer and discard any that is crumpled. • If you are using fanfold paper, verify that it can travel freely without catching, and that the right-side pinwheel is adjusted correctly for the width of your paper (see page 1-6). • Reload the paper (see pages 1-6 through 1-10).

7. Print quality is poor, rows of dots are missing from printouts, or the carriage moves but produces no print.	• Ensure that there is sufficient ink in the cartridge by viewing the bladder. If the bladder is collapsed, replace the cartridge (see Figure 4-1). • Ensure that the carriage latch is fully closed (see page 1-5). • Ensure that you are using a recommended ink jet paper. • Wipe the face of the print head using a tissue to remove any accumulated dust (see Figure 4-2). If the print head cartridge has not been used for a prolonged period, moisten the tissue with water before wiping. • Lightly wipe the electrical connector of the carriage using a cotton swab dipped in alcohol (see Figure 4-3). • If the problem continues, replace the print head cartridge.

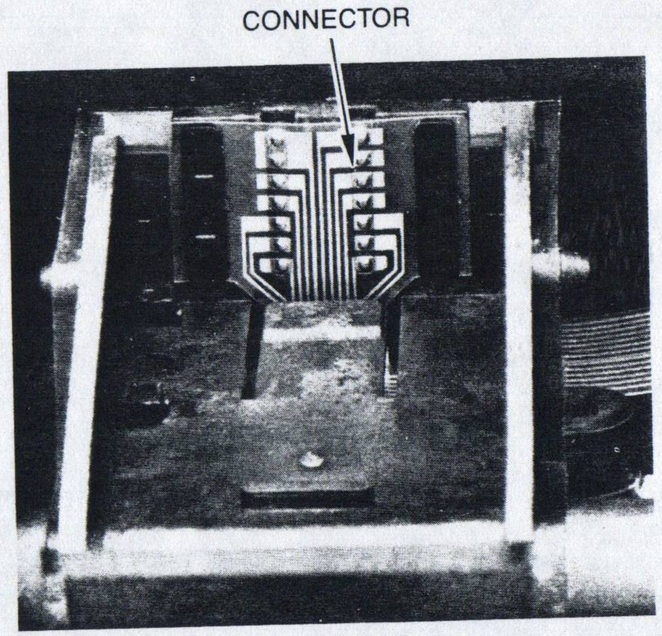


Figure 4-3 Carriage Electrical Connector

Potential for Radio/Television Interference

The HP 2225C printer generates and uses radio frequency energy and may cause interference to radio and television reception. Your printer complies with the specifications in Subpart J of Part 15 of the Federal Communications Commission rules for a Class B computing device. These specifications provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If the printer does cause interference to radio or television reception, which can be determined by turning the printer off and on, you can try to eliminate the interference problem by doing one or more of the following:

- Reorient the receiving antenna.
- Reorient the position of the printer with respect to the receiver.
- Move the printer away from the receiver.
- Plug the printer into a different outlet so that the printer and the receiver are on different branch circuits.

If necessary, consult an authorized HP dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet, prepared by the Federal Communications Commission, helpful: *How to Identify and Resolve Radio/TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington D. C. 20402, Stock No. 004-000-00345-4.

WARNING

Use of a non-shielded printer interface cable will invalidate the FCC certification.

Mode Select Switches

The eight switches on the rear panel of the printer allow you to configure the default conditions of your printer for most computer systems and applications.

Table A-1
Mode Select Switches (1 through 5)

Switch number and name	Up	Down
1 CR* definition	CR does CR, LF	CR does CR only
2 LF definition	LF does CR, LF	LF does LF only
3 Perforation skip mode	1" perforation skip	no perforation skip
4 Page length	12" (304.8 mm)	11" (279.4 mm)
5 Control sequence mode	Alternate	HP

*Note: CR = Carriage Return
LF = Line Feed

Table A-2
Mode Select Switches (6 through 8)

Switch Settings 6	7	8	Character Set
down	down	down	Roman-8
up	down	down	United States ASCII
down	up	down	Swedish
up	up	down	Italian
down	down	up	French
up	down	up	German
down	up	up	United Kingdom
up	up	up	Spanish

Setting the Mode Select Switches

The switch settings in Table A-3 can be used as a guide for configuring some computer systems.

Table A-3
Mode Select Configuration Guide
(8½" x 11" paper, English language)

Computer	Switch Settings 1	2	3	4	5	6	7	8
Hewlett-Packard	down	down	down	down	down	down	down	down
IBM PC	down	up	down	down	up	up	down	down
Apple	down	up	down	down	up	up	down	down
Radio Shack	up	down	down	down	up	up	down	down

If your computer system is not included in Table A-3, or the format of your printouts is incorrect, the following instructions will help you correctly configure your printer.

Before using these instructions, you must obtain some printout from your computer and printer. If you are going to use your printer with software such as a spreadsheet program or a word processor, use your software to generate some printout. Alternatively you may generate printout with a short BASIC program such as the following example.

```
10 FOR I = 1 TO 10
20 PRINT "This is a line of sample output for testing my printer."
30 NEXT I
40 END
```

If your printer does not respond to your computer at all, try setting switch 6 on the rear panel of your printer up. If you still get no response, refer to the owner's manual for your computer or parallel printer interface card.

NOTE

The printer reads the switch settings only when it is first turned on. Therefore if you change any of the switch settings, you must turn the printer off for several seconds and back on before printing.

The switches are numbered from 1 (closest to the power switch) to 8 (farthest from the power switch). The remainder of this section describes, for each switch, conditions which may cause you to change the switch setting. If none of the conditions apply, leave the switch at its current setting.

Switch 1 - Carriage Return (CR) Definition

If your printer does not advance the paper between lines of print, set switch 1 up. The printer will add a line feed to each carriage return it receives.

If your printout is double spaced, set switch 1 down. The printer will not add a line feed to each carriage return.

Switch 2 - Line Feed (LF) Definition

If some lines of your printout start too far to the right, or only the first line is printed, set switch 2 up. This causes the printer to add a carriage return to each line feed it receives.

If some lines of your printout start too far to the left, set switch 2 down. The printer will not add a carriage return to each line feed.

Switch 3 - Perforation Skip Mode

If you are listing programs or using software which does not provide top and bottom margins in your printout, set switch 3 up. This will put the printer in perforation skip mode. In this mode the printer automatically provides top and bottom margins.

If you do not want top and bottom margins or you are using software such as a word processor which already provides margins, set switch 3 down. This turns off perforation skip mode.

Switch 4 - Page Length

If you are using 12" (304.8 mm) paper, set switch 4 up. This sets the printer's page length to 12 inches (304.8 mm).

If you are using 11" (279.4 mm) paper, set switch 4 down. This sets the printer's page length to 11 inches (279.4 mm).

Switch 5 - Select HP or Alternate Control Sequence Mode

If you are using software such as a word processor or graphics package that does not expect a Hewlett-Packard printer but does expect one of the following printers;

- Epson MX-80
- Epson MX-100
- IBM 80 CPS Printer
- IBM Graphics Printer

set switch 5 up. This puts your printer in Alternate Control Sequence Mode which will work correctly with many software packages.

If you are using software which expects a Hewlett-Packard printer or you are writing your own software, set switch 5 down. This puts your printer in HP Control Sequence Mode.

Switches 6, 7, and 8 - Select Character Set

The HP 2225C printer contains 8 different character sets. Switches 6, 7, and 8 together select which character set is being used for printouts. The 8 character sets and the switch settings used to select them are contained in the following table.

Table A-4
Character Set Selection

Switch Settings 6	7	8	Character Set
down	down	down	Roman-8
up	down	down	United States ASCII
down	up	down	Swedish
up	up	down	Italian
down	down	up	French
up	down	up	German
down	up	up	United Kingdom
up	up	up	Spanish

If you are using an HP computer system which is already configured for the language you want printed, use the Roman-8 character set. Otherwise select the appropriate language character set from the list.

For more details on the character sets, see Appendix D.

Appendix B

Table of HP Mode Print Features

You may use the escape sequences and control codes of this table only if switch 5 on the rear panel of the printer is down. If switch 5 is up, you must use the escape sequences and control codes found in Appendix C.

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
PRINT PITCHES			
Normal (default) (12 cpi, 80 cpl)	ESC & k 0 S	27, 38, 107, 48, 83	1B, 26, 6B, 30, 53
Expanded (6 cpi, 40 cpl)	ESC & k 1 S	27, 38, 107, 49, 83	1B, 26, 6B, 31, 53
Compressed (21.3 cpi, 142 cpl)	ESC & k 2 S	27, 38, 107, 50, 83	1B, 26, 6B, 32, 53
Expanded-Compressed (10.7 cpi, 71 cpl)	ESC & k 3 S	27, 38, 107, 51, 83	1B, 26, 6B, 33, 53
BOLD MODE			
Bold mode on	CTL N	14	0E
Bold mode off (default)	CTL O	15	0F
UNDERLINE			
Underline on	ESC & d D	27, 38, 100, 68	1B, 26, 64, 44
Underline off (default)	ESC & d @	27, 38, 100, 64	1B, 26, 64, 40
LINE SPACING			
6 lines/inch (default)	ESC & *l* 6 D	27, 38, 108, 54, 68	1B, 26, 6C, 36, 44
8 lines/inch	ESC & *l* 8 D	27, 38, 108, 56, 68	1B, 26, 6C, 38, 44
PERFORATION SKIP			
Perforation skip on	ESC & *l* 1 L	27, 38, 108, 49, 76	1B, 26, 6C, 31, 4C
Perforation skip off (switch 3 sets default)	ESC & *l* 0 L	27, 38, 108, 48, 76	1B, 26, 6C, 30, 4C
PAGE LENGTH			
# lines/page* (switch 4 sets default)	ESC & *l* # P	27, 38, 108, #, ..#, 80	1B, 26, 6C, #, ..#, 50
TEXT LENGTH			
# lines/text area*	ESC & *l* # F	27, 38, 108, #, ..#, 70	1B, 26, 6C, #, ..#, 46
END OF LINE WRAP-AROUND			
Wrap-around on	ESC & s 0 C	27, 38, 115, 48, 67	1B, 26, 73, 30, 43
Wrap-around off (default)	ESC & s 1 C	27, 38, 115, 49, 67	1B, 26, 73, 31, 43

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
DISPLAY FUNCTIONS MODE			
Display Functions on	ESC Y	27, 89	1B, 59
Display Functions off (default)	ESC Z	27, 90	1B, 60
UNIDIRECTIONAL OR BIDIRECTIONAL PRINT			
Unidirectional print	ESC & k 0 W	27, 38, 107, 48, 87	1B, 26, 6B, 30, 57
Bidirectional text print (default)	ESC & k 1 W	27, 38, 107, 49, 87	1B, 26, 6B, 31, 57
PRINT POSITION CONTROLS			
Line Feed	CTL J	10	0A
Carriage Return	CTL M	13	0D
Back Space	CTL H	8	08
Half Line Feed	ESC =	27, 61	1B, 3D
Form Feed	CTL L	12	0C
GRAPHICS			
Select low density graphics	ESC * r 640 S	27, 42, 114, 54, 52, 48, 83	1B, 2A, 72, 36, 34, 30, 53
Select high density graphics	ESC * r 1280 S	27, 42, 114, 49, 50, 56, 48, 83	1B, 2A, 72, 31, 32, 38, 30, 53
Raster dot row*	ESC * b # W	27, 42, 98, #, ..#, 87	1B, 2A, 62, #, ..#, 57
Begin raster graphics	ESC * r A	27, 42, 114, 65	1B, 2A, 72, 41
End raster graphics	ESC * r B	27, 42, 114, 66	1B, 2A, 72, 42

AUTOMATIC LINE TERMINATION

Character** Received	Character(s) Executed	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
CR LF FF	CR LF FF } (default)	ESC & k 0 G	27, 38, 107, 48, 71	1B, 26, 6B, 30, 47
CR LF FF	CR, LF LF FF	ESC & k 1 G	27, 38, 107, 49, 71	1B, 26, 6B, 31, 47
CR LF FF	CR CR, LF CR, FF	ESC & k 2 G	27, 38, 107, 50, 71	1B, 26, 6B, 32, 47
CR LF FF	CR, LF CR, LF CR, FF	ESC & k 3 G	27, 38, 107, 51, 71	1B, 26, 6B, 33, 47

(switches 1 and 2 set default)

SELF TEST Perform self test	ESC z	27, 122	1B, 7A
RESET Perform reset	ESC E	27, 69	1B, 45

*When using the decimal or hexadecimal form of these escape sequences, you must substitute the decimal or hexadecimal form of each digit of the value field (#). For example, the character "7" is represented in ASCII as 55 decimal or 37 hexadecimal; the character "2" is represented in ASCII as 50 decimal or 32 hexadecimal (see Appendix D). Therefore the escape sequence ESC & *l* 72 P has a decimal form of 27,38,108,55,50,80 and a hexadecimal form of 1B,26,6C,37,32,50.

**Note: CR = Carriage Return
LF = Line Feed
FF = Form Feed

Roman-8

The Roman-8 character set is an 8-bit character set. In addition to all of the characters of the standard ASCII character set, shown in Table D-1, it contains the international characters and symbols which are displayed in Table D-2.

Table D-1
Roman-8 Characters (ASCII)

CHAR.	DEC.	HEX.
CTL@	0	00
CTLA	1	01
CTLB	2	02
CTLC	3	03
CTLD	4	04
CTLE	5	05
CTLF	6	06
CTLG	7	07
CTLH	8	08
CTLI	9	09
CTLJ	10	0A
CTLK	11	0B
CTLL	12	0C
CTLM	13	0D
CTLN	14	0E
CTLO	15	0F
CTLP	16	10
CTLQ	17	11
CTLR	18	12
CTLS	19	13
CTLT	20	14
CTLU	21	15
CTLV	22	16
CTLW	23	17
CTLX	24	18
CTLY	25	19
CTLZ	26	1A
CTL[	27	1B
CTL\	28	1C
CTL]	29	1D
CTL^	30	1E
CTL_	31	1F
	32	20
!	33	21
"	34	22
#	35	23
$	36	24
%	37	25
&	38	26
'	39	27
(	40	28
)	41	29
*	42	2A
+	43	2B
,	44	2C
-	45	2D
.	46	2E
/	47	2F
0	48	30
1	49	31
2	50	32
3	51	33
4	52	34
5	53	35
6	54	36
7	55	37
8	56	38
9	57	39
:	58	3A
;	59	3B
<	60	3C
=	61	3D
>	62	3E
?	63	3F
@	64	40
A	65	41
B	66	42
C	67	43
D	68	44
E	69	45
F	70	46
G	71	47
H	72	48
I	73	49
J	74	4A
K	75	4B
L	76	4C
M	77	4D
N	78	4E
O	79	4F
P	80	50
Q	81	51
R	82	52
S	83	53
T	84	54
U	85	55
V	86	56
W	87	57
X	88	58
Y	89	59
Z	90	5A
[	91	5B
\	92	5C
]	93	5D
^	94	5E
_	95	5F
`	96	60
a	97	61
b	98	62
c	99	63
d	100	64
e	101	65
f	102	66
g	103	67
h	104	68
i	105	69
j	106	6A
k	107	6B
l	108	6C
m	109	6D
n	110	6E
o	111	6F
p	112	70
q	113	71
r	114	72
s	115	73
t	116	74
u	117	75
v	118	76
w	119	77
x	120	78
y	121	79
z	122	7A
{	123	7B
|	124	7C
}	125	7D
~	126	7E
■	127	7F

Table D-2
Roman-8 Characters (Roman Extension)

CHAR.	DEC.	HEX.
NU	128	80
SH	129	81
SX	130	82
EX	131	83
ET	132	84
EQ	133	85
AK	134	86
AQ	135	87
BS	136	88
HT	137	89
LF	138	8A
VT	139	8B
FF	140	8C
CR	141	8D
SO	142	8E
SI	143	8F
DL	144	90
D1	145	91
D2	146	92
D3	147	93
D4	148	94
NK	149	95
SY	150	96
EB	151	97
CN	152	98
EM	153	99
SB	154	9A
EC	155	9B
FS	156	9C
GS	157	9D
RS	158	9E
US	159	9F
	160	A0
À	161	A1
Â	162	A2
È	163	A3
Ê	164	A4
Ë	165	A5
Î	166	A6
Ï	167	A7
´	168	A8
`	169	A9
^	170	AA
¨	171	AB
~	172	AC
Ù	173	AD
Û	174	AE
£	175	AF
¯	176	B0
	177	B1
	178	B2
°	179	B3
Ç	180	B4
ç	181	B5
Ñ	182	B6
ñ	183	B7
¡	184	B8
¿	185	B9
¤	186	BA
£	187	BB
¥	188	BC
§	189	BD
ƒ	190	BE
¢	191	BF
â	192	C0
ê	193	C1
ô	194	C2
û	195	C3
á	196	C4
é	197	C5
ó	198	C6
ú	199	C7
à	200	C8
è	201	C9
ò	202	CA
ù	203	CB
ä	204	CC
ë	205	CD
ö	206	CE
ü	207	CF
Å	208	D0
î	209	D1
Ø	210	D2
Æ	211	D3
å	212	D4
í	213	D5
ø	214	D6
æ	215	D7
Ä	216	D8
ì	217	D9
Ö	218	DA
Ü	219	DB
É	220	DC
ï	221	DD
ß	222	DE
Ô	223	DF
Á	224	E0
Ã	225	E1
ã	226	E2
Ð	227	E3
ð	228	E4
Í	229	E5
Ì	230	E6
Ó	231	E7
Ò	232	E8
Õ	233	E9
õ	234	EA
Š	235	EB
š	236	EC
Ú	237	ED
Ÿ	238	EE
ÿ	239	EF
Þ	240	F0
þ	241	F1
	242	F2
	243	F3
	244	F4
	245	F5
—	246	F6
¼	247	F7
½	248	F8
ª	249	F9
º	250	FA
«	251	FB
■	252	FC
»	253	FD
±	254	FE
■	255	FF

International Character Sets

The HP 2225C printer contains seven, 7-bit, international character sets. These character sets are all very similar to characters 0 through 127 of the Roman-8 character set, found in Table D-1. Table D-3 shows the differences between Roman-8 and the seven international character sets.

Table D-3
International Character Sets

Dec.	Roman-8	US ASCII	Swedish	Italian	French	German	UK	Spanish
35	#	#	#	£	£	#	£	£
36	$	$	¤	$	$	$	$	$
39	'	'	'	'	'	'	'	'
64	@	@	É	§	à	§	@	§
91	[	[	Ä	°	°	Ä	[	¡
92	\	\	Ö	ç	ç	Ö	\	Ñ
93	]	]	Å	é	§	Ü	]	¿
94	^	^	Ü	^	^	^	^	^
96	`	`	é	ù	`	`	`	`
123	{	{	ä	à	é	ä	{	°
124	|	|	ö	ò	ù	ö	|	ñ
125	}	}	å	è	è	ü	}	ç
126	~	~	ü	ì	¨	ß	~	~

Changing the Fuse or Line Voltage

Figures E-1 and E-2 show the two possible rear panel configurations for the HP 2225C printer.

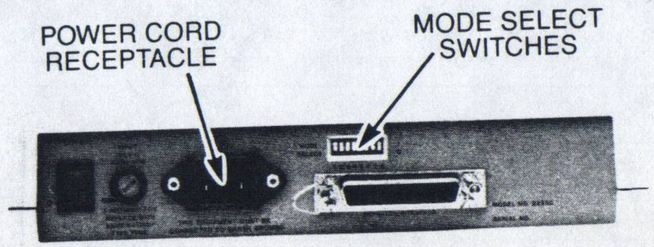


Figure E-1 United States Rear Panel

If the rear panel of your printer looks like Figure E-1, it must be operated from 120 volt AC, 50/60 Hz, line voltage. Operating it from any other voltage may cause damage to your printer. The fuse for the printer is inside the round fuseholder on the rear panel of the printer. To remove the fuseholder, push the cap of it in with a wide-blade screwdriver and turn it counter-clockwise. To insert a new fuse, put the fuse in the fuseholder, push the fuseholder into the cavity with a wide-blade screwdriver, and turn the fuseholder clockwise.

If your printer has the United States rear panel, you do not need to read any more of this appendix; the remainder deals with the international rear panel.

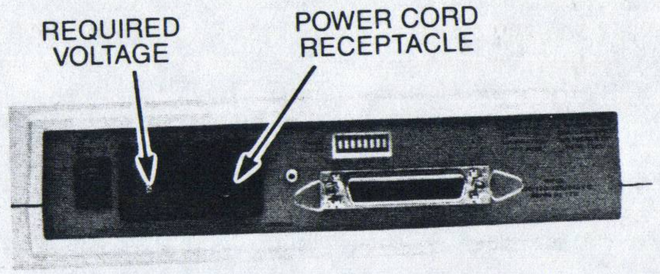


Figure E-2 International Rear Panel

If the rear panel of your printer looks like Figure E-2, it has one of the international options and is capable of operating from one of the following AC power sources:

- 100 volt AC, 50/60 Hz
- 120 volt AC, 50/60 Hz
- 220 volt AC, 50/60 Hz
- 240 volt AC, 50/60 Hz

The fuse box on the rear panel of the printer contains a voltage selector drum for selecting one of the four line voltages. The line voltage your printer is set for is visible through the small window in the cover of the fuse box.

Selecting a Line Voltage, international options

WARNING

Incorrect voltage selection or fuse may cause damage to your printer. Read and follow all instructions carefully.

To select a line voltage:

- Remove the power cord from the printer.
- Open the cover of the fuse box with a small screwdriver. The cover closes tightly but will yield to firm pressure.
- Pull out the voltage selector drum.
- Rotate the voltage selector drum until the setting that corresponds to the line voltage in your area faces out, and insert it back into its slot. Do not force the voltage selector drum into the slot; if it is turned upside down it will not fit.

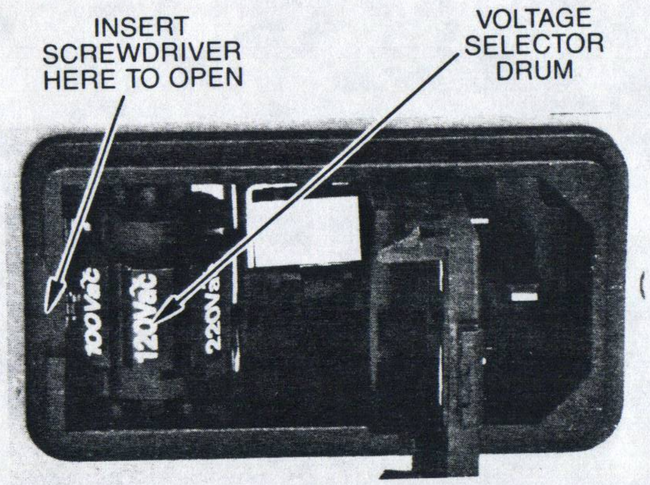


Figure E-3 Fuse Box

- Close the cover of the fuse box (firmly) and confirm that the correct voltage is visible through the window.
- Before using the printer, you MUST ensure that the correct fuse is installed as explained in the following section.

Replacing the Fuse, international options

The fuse for the HP 2225C is located behind the cover of the fuse box. The fuse is in a carrier which slides into a cavity in the fuse box. There are two cavities for fuse carriers; one above the other. The fuse must be installed in the UPPER cavity. The white arrows on the inside of the fuse box cover point up, to the correct cavity.

Two fuse carriers can be used with the printer, one (white) for U.S. style fuses, and one (black) for European style fuses. The correct carrier for your area was supplied with your printer. If you wish to use your printer with a line voltage which requires the other fuse carrier, contact your local Hewlett-Packard dealer or authorized sales representative. An unused carrier may be stored in the lower cavity of the fuse box.

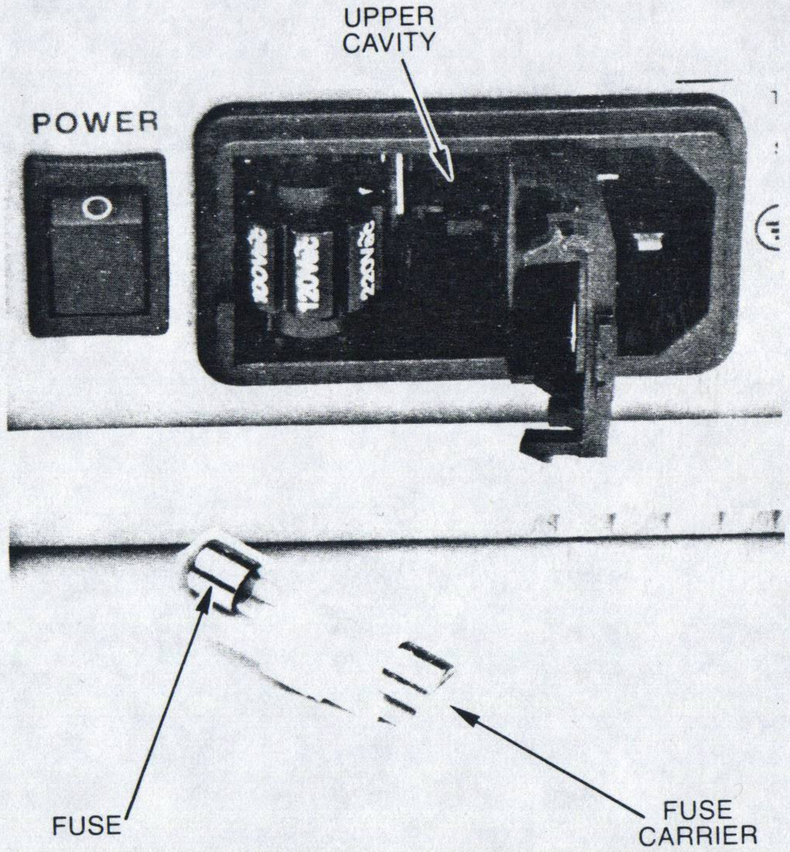


Figure E-4 Fuse Replacement

To replace a fuse:

- Remove the carrier from the upper cavity.
- Replace the fuse with a new fuse of the correct type and rating (see Table E-1).
- Put the selected fuse in the correct fuse carrier and slide the carrier into the upper cavity. The end of the carrier without the arrow should slide into the cavity first. The arrow on the end of the carrier is visible and pointing up when the carrier is correctly installed.

Table E-1 specifies the correct fuse size, ampere rating, and fuse carrier for different areas and line voltages.

Table E-1
Fuse Sizes and Ratings

Line Voltage	Area	Fuse Rating	Fuse Size	Carrier
100 volt AC	Japan	500 ma TD	3AG	white
120 volt AC	USA	400 ma TD	3AG	white
220 volt AC	Europe	250 ma TD	5 x 20mm	black
240 volt AC	UK	200 ma TD	5 x 20mm	black

Power Cords, international options

The power cord supplied with your printer should match the plug requirement for your area. However, power cords with different plugs are available for printers with an international options and are illustrated in Figure E-5. If you wish to use a different power cord, contact your local Hewlett-Packard dealer or sales representative.

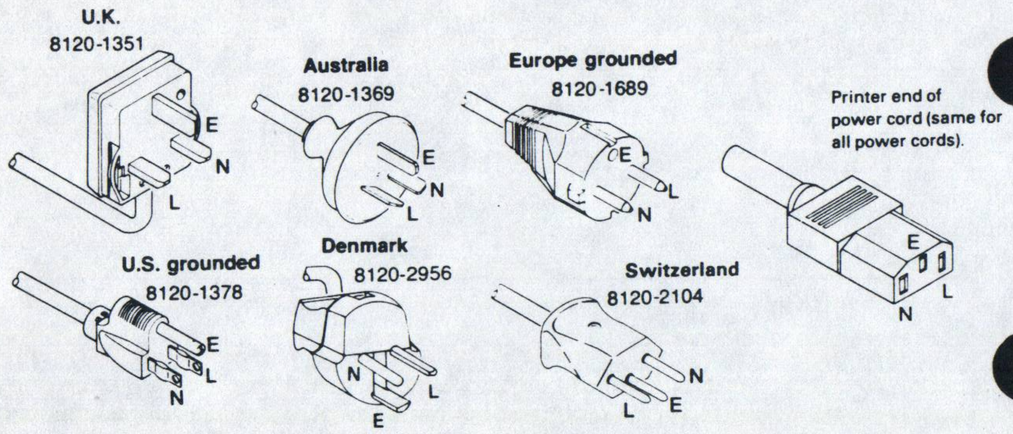


Figure E-5 Available Power Cords

Parallel Interface Specifications

The HP 2225C printer uses a standard parallel printer interface which is compatible with many personal computers.

Printer Connector Pin Assignments

The printer interface connector is compatible with a standard Amphenol-type, 36-pin connector.

The direction conventions used in Table F-1 are:

"In" - The signal is received by the printer from the computer.

"Out" - The signal is transmitted by the printer to the computer.

Table F-1
Pin Assignments

Pin No.	Signal	Direction	Description
1	$\overline{\text{Strobe}}$	In	A LOW pulse of width greater than 0.5 µs causes the printer to read one byte of data.
2	DATA 1	In	Data bit 0
3	DATA 2	In	Data bit 1
4	DATA 3	In	Data bit 2
5	DATA 4	In	Data bit 3
6	DATA 5	In	Data bit 4
7	DATA 6	In	Data bit 5
8	DATA 7	In	Data bit 6
9	DATA 8	In	Data bit 7
10	$\overline{\text{Acknlg}}$	Out	The printer sends a LOW pulse to indicate that it has accepted a byte of data and is ready for more data.
11	Busy	Out	A HIGH logic level indicates the printer cannot receive data due to data entry, a full buffer, or error status.
12	OOP	Out	A HIGH logic level indicates the printer is out of paper.
13	Selected	Out	Always HIGH
14,15			Not used
16	Logic Gnd		

17,18			Not used
19 to 30	Logic Gnd		
31	$\overline{\text{Input Prime}}$	In	A LOW pulse of width greater than 40 µs resets the printer and clears the print buffer.
32	$\overline{\text{Error}}$	Out	A LOW level indicates the printer has reached an error state: self test failed or carriage position lost.
33	Logic GND		
34 to 36			Not used

Printer Timing Diagram

The timing diagram, Figure F-1, illustrates the data and handshake lines during transfer of one data byte to the printer. DATA 1 through DATA 8 and the Strobe line are driven by the computer; the Acknlg line is driven by the printer.

Table F-2
Minimum and Typical Timing Intervals

Interval	Description	Minimum Value	Typical Value
t_D	Delay from DATA written to data $\overline{\text{Strobe}}$.	0.5 µs	
t_{SB}	Data $\overline{\text{Strobe}}$ width.	0.5 µs	
t_{ACK}	$\overline{\text{Acknlg}}$ pulse width.		5 µs
t_H	Duration of valid data after $\overline{\text{Strobe}}$.	0.5 µs	

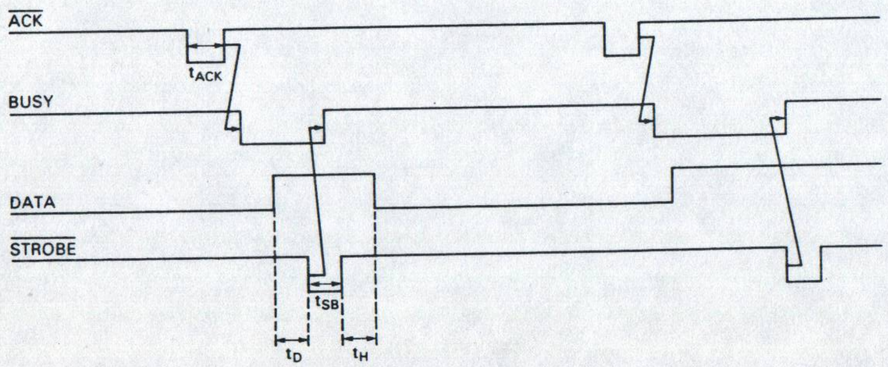


Figure F-1 Timing Diagram

List of Accessories and Supplies

Part No.	Description
92261A	Print Head Cartridge
92261M	Ink Jet Paper — 2000 sheets, single sheets
92261N	Ink Jet Paper — 2500 sheets, fanfold
92261S	Printer Stand — Clear Acrylic
82949A	HP Series 80 Parallel Printer Interface
82957A	HP-86A Printer Cable

These accessories and supplies are available through your local dealer or directly from Hewlett-Packard. For most of the United States, direct ordering information can be obtained by calling, toll-free, 1-800-538-8787. In Alaska, California, or Hawaii, call 1-408-738-4133.

Appendix H

Warranty and Service Information

Warranty Information

The complete limited 90-day warranty statement is included with your printer. Additional copies may be obtained from any authorized Hewlett-Packard dealer, or the sales and service office where you purchased your printer.

If you have any questions concerning this warranty, please contact an authorized Hewlett-Packard dealer or a Hewlett-Packard sales and service office. Should you be unable to contact them, please contact:

- **In the United States:**

  Hewlett-Packard Company
  Personal Computer Group
  Customer Support
  11000 Wolfe Road
  Cupertino, CA 95014
  Telephone: (503) 758-1010

  Toll-Free Number: (800) FOR-HPPC (800 367-4772)

- **In Europe:**

  Hewlett-Packard S.A.
  150, route de Nant-d'Avril
  P.O. Box CH-1217 Meyrin 2
  Geneva
  Switzerland
  Telephone: (022) 83 81 11

  Note: Do **not** send units to this address for repair.

- **In other countries:**

  Hewlett-Packard Intercontinental
  3495 Deer Creek Rd.
  Palo Alto, CA 94304
  U.S.A.
  Telephone: (415) 857-1501

  Note: Do **not** send units to this address for repair.

How to Obtain Repair Service

For information on service in your area, contact an authorized HP dealer or the nearest Hewlett-Packard service facility listed in the limited 90-day warranty statement included with your printer.

If your printer malfunctions and repair is required, you can help assure efficient servicing by having the following items with your printer at the time of service:

- A description of the configuration of the system you were using at the time of failure.
- A brief description of the malfunction symptoms for the service personnel.
- Printouts or other material that illustrate the problem area(s).
- A copy of the sales slip or other proof of purchase to establish the warranty coverage period.

Serial Number

Each printer carries an individual serial number. It is a good idea to keep a separate record of this number. Should your printer be stolen or lost, the serial number is required for insurance claims and is often helpful for tracing and recovery. Hewlett-Packard does not maintain records of individual owners' names and printer serial numbers.

General Shipping Instructions

Should you ever need to ship the printer, be sure that all components are packed in a protective package (use the original shipping case) to avoid in-transit damage. We suggest that you always insure shipments.

If you happen to be outside of the country where you bought your printer, contact the nearest authorized dealer or local Hewlett-Packard office for shipping instructions. All customs and duty charges are your responsibility.

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Page numbers in **bold** type indicate primary references; page numbers in standard type indicate secondary references.